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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/578,514	05/08/2006	Kim Chang-Hae	3449-0622PUS1	5124

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EXAMINER	
HOBAN, MATTHEW E	

ART UNIT	PAPER NUMBER
1793	

NOTIFICATION DATE	DELIVERY MODE
09/02/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

Office Action Summary	Application No.	Applicant(s)	
	10/578,514	CHANG-HAE ET AL.	
	Examiner	Art Unit	
	Matthew E. Hoban	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 May 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *5/08/2006 9/07/2007*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 23 and 24 rejected under 35 U.S.C. 102(b) as being anticipated by Ellens in 6,504,179.

Ellens creates an LED of the structure described at column 5, lines 12-27. The LED has an InGaN, which is a blue color source. This source is disposed on the bottom of the LED and is surrounded by epoxy resin, wherein Y and G phosphors are disposed within this phosphor. At Column 5, Lines 50-70, Ellens describes an embodiment of his invention which uses YAG:Ce and CS: Eu at a ratio of 1:4.6. As can be seen in Figure 7, the emission spectrum for each of these phosphors can be seen. CS:Eu has an emission peak at 510 nm and YAG:Ce has an emission peak at 555 nm (as can be seen in Figure 7). As stated these two phosphors are excited by the InGaN and are thus disposed in the path of blue light and therefore converting the light to green and yellow. Therefore, both the phosphor and semiconductor source emit light.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Regarding Claim 1: Ellens teaches a white LED structure that is different from convention RGB and BY type phosphors. In his invention Ellens teaches that a white LED can be created by a BYG color system, where the B portion can be attributable to either a blue emitter or in a totally different scenario, where a UV emitter is used with all three phosphors of B, Y and G colors (See Column 39-60). It is stated that one

requirement of the phosphors needed for such an invention is the fact that they have a relatively large band, where some amount of emission is in the red band. For this purpose Ellens uses YAG:Ce and a chlorosilicate, where the YAG:Ce is a yellow phosphor, and the chlorosilicate is used as a green phosphor.

Therefore, Ellens does not teach the use of the two strontium silicate:

> wherein a first phosphor having a chemical formula of $Sr_{4-x}Mg_yBa_xSi_zO_8:Eu_x^{2+}$ ($0 < x < 1$, $0 \leq y \leq 1$, $0 \leq z \leq 1$) and a second phosphor having a chemical formula of $Sr_{3-x}SiO_5:Eu^{2+}_x$ ($0 < x \leq 1$).

However, both of these phosphors are known in the art.

Kim teaches a strontium silicate phosphor expressed by the chemical formula $Sr_{3-x}SiO5:Eu_x$, where x is between 0 and 1. This phosphor has an emission spectrum seen in sheet 2 of the figures, where it can be seen that the phosphor is comparable to a YAG:Ce with more of a red shift in the spectrum. Therefore, this strontium silicate is a wide spectrum yellow phosphor, with a considerable amount of emission occurring in the orange to red band. Furthermore, in paragraphs 33-38, this phosphor's use in an LED is demonstrated with an InGaN-based source, where this source emits at 460 nm.

Xiao teaches a silicate phosphor based on the formula $aMO\text{-}bM'O\text{-}cSiO_2\text{-}dR:Eu_x, Ln_y$. In this formula M represents Sr, Ca, Ba and Zn. M' represents Mg, Cd and Be. R represents boric anhydride or diphosphoruspentoxide. Ln is another doping agent. In

the formula a is between .6 and 6, b is between 0 and 5, c is between 1 and 9, d is between 0 and .7 x is between .00000001 and .2 and y is between 0 and .3. This range of phosphors is said to be able to vary from blue to green to yellow in color. This formula is the same as that of the instantly claimed, where M is made up of Sr, and Ba and M' is made up of Mg. Furthermore, when A+B+X=4, Y=0, and C=2 , the formulas are generally the same. Therefore, the formula of Xiao substantially overlap the formula of the instant claims. One of ordinary skill in the art would be able to choose from the portions of these overlapping ranges and arrive at the claimed invention. Overlapping ranges have been held to create a prima facie case of obviousness (MPEP 2144.05). Finally as stated previously Xiao states that these phosphors can range in color from blue to yellow (See Lines 5-45 of Column 2).

Therefore, it would be obvious to use the phosphor of Kim as a yellow phosphor and the phosphor of Xiao as a green phosphor in the teachings of Ellens. The phosphor system would then be made up of the as claimed phosphor system. Ellens gives motivation to do so, as Ellens states that a suitable white LED can be made from phosphors such as those of the cited art. The art of Kim is especially suitable in that it is a red shifted yellow phosphor, and is said to be a replacement for YAG:Ce, a phosphor which is actually used by Ellens. The phosphor of Xiao is a green phosphor which is the second phosphor required by the teachings of Ellens.

Regarding Claim 2-3 and 7: Ellens in view of Kim and Xiao is a phosphor system with the same phosphor blend composition. It therefore, must necessarily follow that the two phosphors in this blend would emit at the claimed peaks when excited by incident light of between 400 and 480 nm.

Regarding Claim 4: Although it is generally routine in the art to vary the relative amounts of phosphors in a blend to produce a desired CRI. Ellens maintains that a varying ratio between these two components can be used by showing examples of the composition where the ratio between the green and yellow phosphor is 4:6 and also where it is 4.6:1. Both of these examples have desirable CRI. These can be seen In Column 5, Lines 25-35 and Column 5, Line 50 through Column 6, Line 5. Therefore, it is obvious and considered routine experimentation to vary the ratio of phosphors in a blend to vary the CRI and the color coordinates of output light.

Regarding Claim 8: The purpose of Ellens is to create white light by combining a yellow and green phosphor with a blue LED source. Therefore, the combination of Ellens with Kim and Xiao continues in this endeavour. The obvious combination of Ellens in view of both Kim and Xiao would therefore, also produce a white light since Kim and Xiao both are directed towards phosphors that maintain the scope of Ellens overall LED.

Regarding Claims 9, 25 and 26: These claims are directed towards incorporating the phosphors into an LED. Ellens discloses an LED structure, which is an InGaN semiconductor. This source is supported by an opaque housing, where it is situated in a recess of this housing. On top of this LED is disposed an epoxy resin, throughout which the phosphor pigments are contained (See Column 5, Lines 12-27). It is therefore, obvious to use this structure for forming a BYG white LED using the Y and G phosphors as described by Ellens. The phosphors of Kim and Xiao (which are explained in the section pertaining to Claim 1) are known Y and G phosphors and then would be obvious choices for such an LED. The language such as “a surface mounting-type" or “lamp type” cannot be given any patentable weight as these terms are deemed an intended use of the product and do not differentiate its composition or structure.

Regarding Claims 10, 12, 14, and 16: Although it is generally routine in the art to vary the relative amounts of phosphors in a blend to produce a desired CRI in LED. Ellens maintains that a varying ratio between these two components can be used by showing examples of the composition where the ratio between the green and yellow phosphor is 4:6 and also where it is 4.6:1. Both of these examples have desirable CRI. These can be seen In Column 5, Lines 25-35 and Column 5, Line 50 through Column 6, Line 5. Therefore, it is obvious and considered routine experimentation to vary the ratio of phosphors in a blend to vary the CRI and the color coordinates of output light. The language such as “is used in a side view type” is an intended use for the LED and cannot be given patentable weight.

Regarding Claims 11, 13, 15, and 17: At column 5, Lines 20-26, Ellens states that less than 15% by weight of the phosphor pigments should be mixed with 80-90% of the epoxy resin. These claims are dependant upon Claim 9, which disposes the light transmitting member and the phosphor as two bodies. Therefore, 15% by weight of the phosphor and 85% by weight means that the content of the phosphor to the resin is ~20 wt% or less (15/85). It would be obvious for one of ordinary skill to vary the amount of phosphor relative to the resin based on the need to vary CRI (for example more phosphor would be desirable if a more intense yellow, green or red tone was needed). Low amounts of phosphor would also be desirable in scenarios, where a bluish white tone was desired. The obviousness stems from basic probability. As the amount of the phosphors increases, as does the amount of phosphorescing centers being disposed linearly through the path of light. It follows that as the amount of phosphorescing centers increases, so does the probability of light being incident on a center, and thus being converted to light of a longer wavelength.

Regarding Claims 18, 19, 21 and 22: Epoxy resin is used as the resin in the transmitting member of Ellens (See Column 5, Lines 12-26). This epoxy is disposed on and fully encapsulates. It is thus entirely provided at the outside of the light source, and by relation must at least be partially provided at the outside of the light source.

Regarding Claim 20: At column 5, Lines 12-26, Ellens explains that the invention is indeed a white light LED, where a blue LED is used as a source, wherein Y and G phosphors are disposed in a resin covering the blue LED. The blue LED thus excited the Y and G phosphors, causing them to emit Y and G light. Therefore, the invention of Ellens emits light from both the light source and by the phosphor together.

6. Claim 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ellens in 6,504,179 in view of Kim in KR-2004-0085039 (For which the US document 2006/0022208 is used as an English Equivalent) and also in view of Xiao in 6093346 as applied to claim 1 above, and further in view of Lee in 2007/0012931.

Please review the rejection of claim 1 under Ellens in view of Kim and Xiao, which makes obvious the phosphor blend of claim 1.

Ellens in view of Kim and Xiao is silent as far as the particle size of the phosphors used in the LED as made by Ellens.

However, Lee teaches that within the art of LED making it is important to maintain certain particle sizes for the phosphor material. Lee describes this at paragraph 46 of his teachings. It is stated that the optimal size of the particles is a mix between particles in the range of 2-50 microns and those with sizes between .1 and 2 microns. The reason for this range is due to the fact that particles greater than these sizes will have low intensity based on the fact that

the particles have low specific surface area and thus low emission per volume. Particles smaller than this size causes a high amount of scattering and also causes problems in processing, where the phosphor can float in the resin. Thus particles within these prescribed ranges are optimal in making LED. Furthermore, these teachings are not directed towards a particular LED system and these considerations should be made in all LED, since scattering and luminous intensity. It would thus be obvious to apply such particle ranges to the obvious combination of Ellens in view of Kim and Xiao and use the phosphors of Kim and Xiao in such a particle range in the LED of Ellens. One of ordinary skill in the art would thus choose the particle size from the overlapping region of the prescribed range and would thus arrive at the as claimed invention. Overlapping ranges have been held to create a prima facie case of obviousness. This would provide an LED with improved intensity without suffering from processing problems.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew E. Hoban whose telephone number is (571) 270-3585. The examiner can normally be reached on Monday - Friday from 7:30 AM to 5 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jerry Lorengo can be reached on (571) 272-1233. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Meh

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